Proposed Plan for Remedial Action
Naval Air Station Jacksonville
Operable Unit 3
Potential Sources of Contamination 11, 12, 13, 14, 15, 16, and 48, Building 780, and Other Areas of Elevated Groundwater Contamination

Jacksonville, Florida

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Terms that appear in **bold** the first time used within the text are defined in the glossary starting on page 25.

1.0 INTRODUCTION

This Proposed Plan presents background information and a discussion of cleanup options for the **contamination** at **Operable Unit (OU) 3**, located at Naval Air Station (NAS) Jacksonville in Jacksonville, Florida (see Figure 1). The cleanup actions are intended to clean up contaminated **media** and prevent exposure to **human** and **ecological receptors** at the site. The cleanup options, or **remedial actions** (RAs), proposed in Section 5 of this plan, are expected to be final

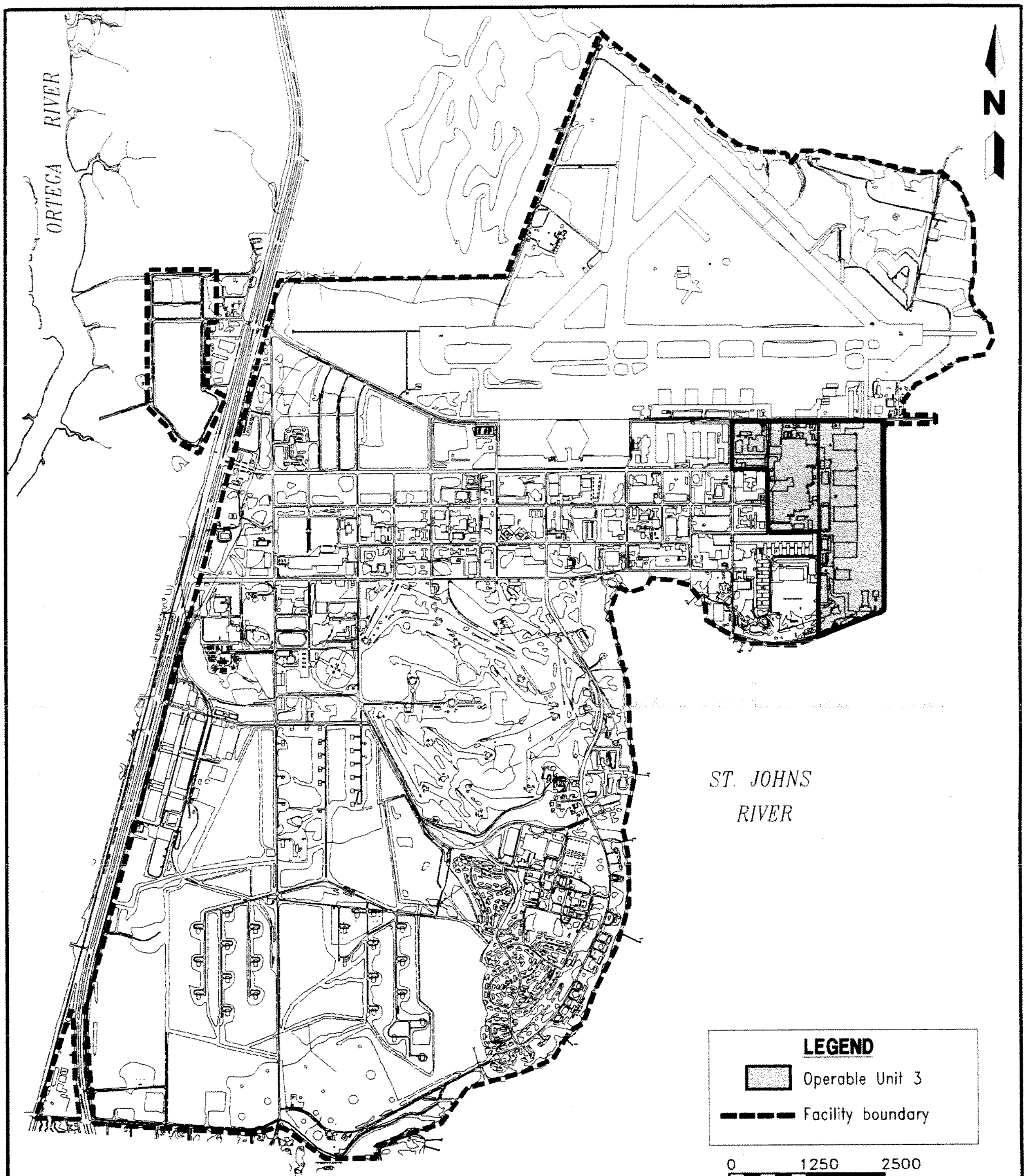

Figure 1: Facility Map and Location of OU 3

solutions for cleaning up OU 3 because each preferred cleanup option:

- is considered protective of human health and the environment,
- complies with Federal and State of Florida regulations,
- utilizes permanent solutions to the maximum extent practicable, and
- satisfies the statutory preference for treatment as a principal element.

The alternatives discussed in this plan were developed by the U.S. Navy, the U.S. Environmental Protection Agency (USEPA), and the Florida Department of Environmental Protection (FDEP). These agencies are working together under a **Federal Facility Agreement (FFA)** which helps direct the environmental cleanup process at NAS Jacksonville.

The Navy completed the **Remedial Investigation and Feasibility Study** (RI/FS) Report in April 2000. The RI/FS evaluated various cleanup methods for OU 3. The Navy, USEPA, and FDEP will further evaluate the cleanup methods after reviewing the comments from the local community.

This document informs the public as required by the **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)** Section 117(a). CERCLA specifies that the Navy must publish a Proposed Plan outlining the various cleanup methods considered in the RI/FS Report. This plan is a required part of the **administrative record** for OU 3. Key information from the RI/FS Report, including a summary of the history and investigation results from OU 3, is highlighted in this document. This plan and other documents on the environmental restoration activities at OU 3 are available for public review at the Charles D. Webb Wesconnett Branch of the Jacksonville Public Library (see *Available Information* on page 24).

Public input during development of the cleanup alternatives is a key element in the decision making process. The **Restoration Advisory Board** (RAB) is a citizen's group that has provided input on cleanup activities. Residents in the surrounding community are encouraged to submit their comments on all of the cleanup methods developed, including the choices preferred by the Navy, during a public **comment period** from April 17, 2000 through May 31, 2000. A public meeting will be provided to further discuss the findings of the RI/FS and the preferred cleanup methods for OU 3. When the comment period ends, the Navy will summarize and respond to public comments in a **Responsiveness Summary**, which will be incorporated as part of the **Record of Decision (ROD)** for OU 3.

2.0 OPERABLE UNIT 3 BACKGROUND

OU 3 is located in the eastern part of NAS Jacksonville, adjacent to the St. Johns River (see Figure 1). The OU 3 area consists primarily of the Naval Aviation Depot (NADEP). Rework, repair, and modification of aircraft, engines, and aeronautical components is the primary mission of NADEP. This area also contains the helicopter flightline and its associated hangars, and is nearly all covered with thick pavement or buildings.

There are six **Potential Sources of Contamination** (PSCs) within the boundaries of OU 3 (Figure 2). Five of these (PSCs 11, 12, 13, 14, and 15) were associated with past operations related to the maintenance of military aircraft. The sixth PSC (PSC 48) is associated with the station's dry cleaning operations. A seventh PSC (PSC 16) is the **discharge** point for a large portion of the **storm water** runoff from OU 3. Field investigations and/or cleanup activities have also been conducted at several other areas within OU 3 (MILCON P-615, MILCON P-159, Building 780, and the Kemen Test Cell). A brief description of each PSC and Building 780 follows:

PSC 11: Building 101. Building 101, the largest building at NAS Jacksonville, houses administrative offices, aircraft parts repair shops, a machine shop, airplane hangars and other rework or repair areas. In addition to the hangar area where **solvents** were used, a plating shop used chromium, copper, lead, nickel, silver, and tin in its **plating** process (from the early 1940s until 1990) in the southeast corner of Building 101 (see Figure 2). During the period of operation there were reports of numerous spills, leaks, and unauthorized disposal of chemicals within the plating shop area.

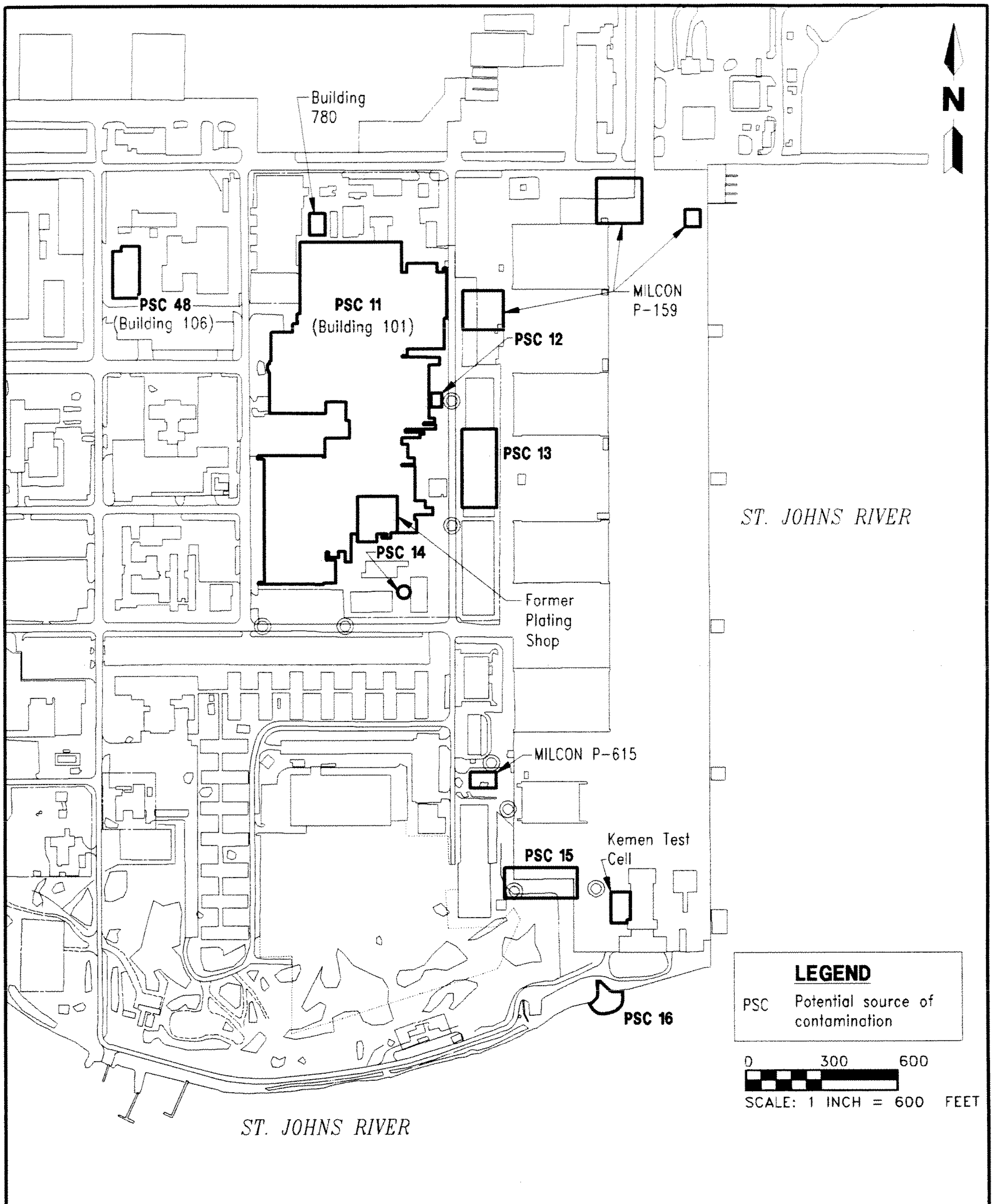

Figure 2: Locations of PSCs Within OU 3

PSC 12: Old Test Cell Building. This is a small, one story building which stored various chemicals, waste oil, fuels, and solvents for use during the testing of engines. There were reportedly numerous spills of **toxic** and **reactive chemicals** from ruptured or rusted drums stored at PSC 12. Also, there were leaks and cross-connections between the sewer lines (sanitary, industrial, and storm water) in this area which may have allowed contaminants to get into the surrounding soils. The cross-connections were eliminated and the sewer lines replaced along Wright Street during 1992 and early 1993.

PSC 13: Radium Paint Disposal Pit. The former pit was located adjacent to the area where aircraft instrument dials were painted with **radium** paint. The paint wastes and broken or discarded dials were disposed in a 50 foot by 40 foot pit that was approximately 1 foot deep. This pit was used from World War II until the late 1950s.

PSC 14: Battery Shop. A **seepage pit**, approximately 2 1/2 feet in diameter and 6 feet deep, was located on the west side of the Battery Shop. This pit was used for the disposal of lead battery acid from 1959 to 1982. It was reported that 100 gallons of acid were dumped in the pit every year for approximately 23 years.

PSC 15: Solvent and Paint Sludge Disposal Area. The disposal area was reported to be approximately 100 feet by 100 feet in size. Waste solvent and paint **sludges** were placed on the ground and mixed with soil or allowed to seep into the ground or dry on the surface. An estimated 2,000 gallons of waste per year were disposed in this area for 36 years.

PSC 48: Dry Cleaners. From 1962 until 1990 the Station's Dry Cleaners used approximately 150 gallons of **tetrachloroethene** (PCE) per month. The PCE was stored in a 150-gallon tank located next to the dry cleaning machine. During the site-screening field program (SSFP) high levels of PCE and its breakdown products were found in the **groundwater**. In 1990 the dry cleaning system was redesigned and upgraded.

PSC 16: Black Point Storm Sewer Discharge. The storm sewers that drain the southern half and portions of the northern half of NADEP discharge to the St. Johns River at PSC 16. The Navy has documented numerous spills of JP-5 jet fuel, hydraulic oil, and various other chemicals which may have gotten into the storm sewers and discharged at PSC 16. Because of the potential for toxic substances to enter the St. Johns River through the storm sewer system, PSC 16 was added to the RI/FS for OU 3.

Building 780: Building 780 was originally used as an area for cleaning, paint stripping, and painting aircraft parts, such as the wing fuel tanks. During 1991, the Navy's contractor encountered high concentrations of **volatile organic compounds** (VOCs) in soils at the site. The contaminated soil was removed from the site and replaced with clean fill.

2.1 SUMMARY OF PREVIOUS INVESTIGATIONS

OU 3 has undergone several investigations starting with the **Initial Assessment Study** (IAS) and **Verification Study** during the early and mid 1980s. The environmental concerns at OU 3 were addressed during the RI using a multi-staged approach. Each stage of the RI is described briefly as follows:

2.1.1 Stage 1 (1993)

Activities. An initial OU 3-wide screening was completed to develop an understanding of the soil and groundwater conditions within the OU and to identify the types and distribution of contamination. The first stage investigation included the following:

- **piezometer** installation and groundwater level measurements;
- soil sampling;
- soil borings;
- groundwater sampling; and
- **aquatic habitat characterization**.

Results. Results from the initial site screening are presented in the OU 3 RI/FS Workplan, dated

March 1995. Based on these results, 10 areas were identified with elevated levels of groundwater contamination. The contamination consisted primarily of **chlorinated** VOCs (e.g., drycleaning solvent and degreasing chemicals).

2.1.2 Stage 2 (1996)

Activities. The major components of the second stage investigation included the following:

- Further investigation and evaluation of the ten areas with **elevated groundwater contamination (hot spots)** through the use of sampling and **monitoring well** installations.
- Measuring **natural attenuation** parameters at the hot spot areas.
- Collection and laboratory analysis of shallow soil samples at the Old Test Cell Building (PSC 12) and the Battery Shop (PSC 14).
- Digging test pits at PSC 15 to try and locate the former disposal area boundaries.
- **Interim removal actions** (IRAs) at PSC 48 (Building 106) and Building 780 (two of the 10 hot spots).

Results. The areas of elevated groundwater contamination were found to be isolated spots, and movement of the contaminants is slow. The measuring of natural attenuation parameters indicated that **biodegradation** of contaminants was possible and that it was already occurring in some areas.

The soil investigation at PSCs 12 and 14 identified several **inorganics** at both locations and one **organic** compound, di-n-octylphthalate, at PSC 12. Most of the inorganics detected at both locations were at or below **background levels**, although lead was more than 3 times the background level at PSC 14.

The location of the solvent and paint sludge disposal area at PSC 15 could not be determined. However, soil containing **radionuclides** above background levels was encountered in some test pits. The radiation was probably the result of radium paint used for luminous dials being disposed in the area during the late 1940s and 1950s. A **radiological survey** of the area was conducted and the affected soils were excavated. The removed soil was placed beneath the landfill cap at OU 1 along with other NAS radioactive waste.

Findings from the second stage activities are presented in two reports: *Engineering Evaluation and Cost Analysis for Buildings 106 and 780*, dated August 1995, and *Engineering Evaluation of Areas with Elevated Groundwater Contamination at OU 3*, dated March 1998.

Summary of IRAs. Two IRAs are ongoing at OU 3 to address groundwater contamination. The IRAs were initiated at PSC 48 (Building 106) and Building 780 because of elevated concentrations of VOCs in groundwater. The objectives of the IRAs are to reduce present or future risks posed to human health and the environment and to reduce contaminant concentrations.

An **air sparging** and **soil vapor extraction** (SVE) system at PSC 48 (Building 106) was brought online in March 1998. Startup of the treatment system and performance during the first year of operation is documented in an IRA Operations report, dated June 1999. After 1 year of system operation, the treatment system is removing significant quantities of contaminants.

A second IRA, conducted at Building 780, includes **groundwater extraction and treatment** and SVE. Startup activities, conducted between April and May 1998, are documented in an IRA Startup Activities Report, dated June 1999. From May 1998 until March 1999 the system only operated intermittently due to equipment problems. However, these problems were resolved and the treatment system has been operating continuously since March 1999, and is removing contaminants from the groundwater and soil.

Previous removal actions were also completed at PSCs 11 and 13. During the period from 1992 through 1995 a removal action was conducted at the former plating shop located in the southeast corner of Building 101. Storage tanks, dip tanks, wash tanks, and all associated piping were removed along with the concrete floor and the soil beneath. The tanks, piping, and soil were all disposed offsite at a permitted hazardous waste disposal facility. Following removal of the tanks and piping, the plating shop building was demolished and removed. Groundwater within the former plating shop area continues to be sampled and analyzed on a quarterly basis.

During the late 1950s, radium paint waste, discarded luminous dials and associated contaminated soil were removed from the disposal pit at PSC 13. These materials were placed at PSC 18 but then moved to OU 1 in 1995. In 1995 a radiological survey was conducted at PSC 13. Additional contaminated soil and painted dials were found surrounding the pit area. These contaminated soils and dials were then removed and placed under the landfill cap at OU 1.

2.1.3 Stage 3 (1998)

Activities. The objective of the third stage activities was to obtain additional information required to complete the RI/FS. Components of the third stage investigation are presented in the "Remedial Investigation and Feasibility Study for OU 3" report, dated April 2000, and are summarized below:

- groundwater, **surface water**, **sediment**, and **storm sewer water** samples were collected and analyzed;
- potential **risk** to human health or the environment associated with site contaminants was evaluated (i.e., the **risk assessment**); and
- cleanup options were developed and evaluated.

Results. The major conclusions from the field investigations and the risk assessment are presented below.

- Groundwater contamination is limited to nine relatively small, discrete **plumes** identified as Areas A, B, C, D, E, F, G, Building 106, and Building 780 (see Figure 3). The plumes appear to be left over from past operations on the site. Contaminants of concern within the groundwater are primarily PCE, **trichloroethene** (TCE), **dichloroethene** (DCE), and **vinyl chloride**. The combined plume areas cover approximately 11 acres out of the total 134 acres within OU 3.
- There is no evidence of ongoing sources of contamination within the soil.
- Water in the storm sewers at the southern portion of OU 3 contains elevated concentrations of TCE, potentially from **infiltration** of contaminated groundwater.
- A localized spot of sediment in the St. Johns River (at PSC 16) is contaminated with **polycyclic aromatic hydrocarbons** (PAHs) and lead at concentrations that are toxic to ecological receptors. **Tar balls** were found in this area and are believed to be the source of this contamination.

2.2 OU 3 SITE CHARACTERISTICS

Site characteristics unique to OU 3 were considered in the development of an overall cleanup strategy for OU 3:

2.2.1 Land Use

NAS Jacksonville has not been listed on any base closure list and is not expected to close at any time in the foreseeable future. The industrial activities conducted at OU 3 are essential to the success of NADEP and NAS Jacksonville, and, therefore, the use of OU 3 for purposes other than industrial is highly improbable.

As a result of the industrial nature of NADEP, nearly all of OU 3 is covered with thick pavement or buildings. As such, the variety and number of animals affected is limited because there is little food for them. The amount of surface soil is minimal and mostly limited to the area at the south end of the OU, near the storm sewer outfall.

Land Use Controls (LUCs) have been implemented at NAS Jacksonville through a Memorandum of Agreement (MOA) between the Navy, the USEPA, and the FDEP. According to the MOA, a Land Use Control Implementation

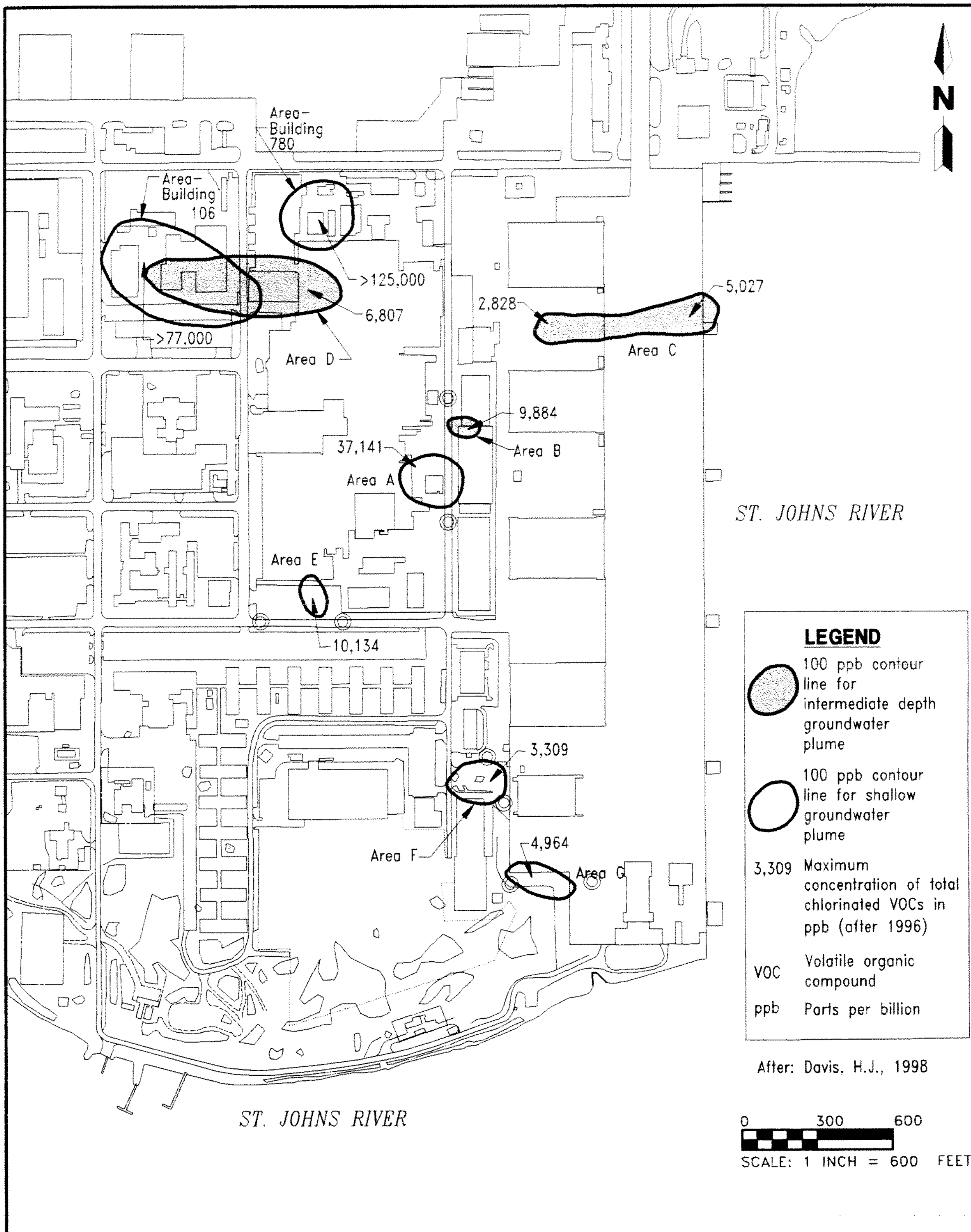

Figure 3: Locations of Areas With Elevated Groundwater Contamination Within OU 3

Plan (LUCIP) would be prepared for specific areas at OU 3. The LUCIP specifies how the land can be used and is intended to prevent people from being exposed to contamination. The MOA specifies that the land use controls will remain in place until the use of the property changes, at which time the USEPA and the FDEP must review site conditions.

2.2.2 Groundwater Movement Within the Site
The movement of contamination within groundwater at OU 3 is controlled by complex layers of soil; i.e., combinations of clay, silt, and sand. The **surficial aquifer**, groundwater located 5 to approximately 80 feet below ground, is divided into an upper and lower zone. The upper zone is separated from the lower zone by a continuous dense clay layer (greater than 10 feet in thickness) in the northern half of the operable unit, but this layer is broken up causing gaps which connect the upper and lower zones in the southern half.

Even though small areas of contaminated groundwater, called plumes, exist in the groundwater system, they are moving very slowly. A computer model designed by the U.S. Geological Survey, Tallahassee, Florida, determined that it will take 60 years or longer for contamination to reach the St. Johns River. However, it should be noted that a natural breakdown of the contamination is occurring in the upper zone of the groundwater and the contamination could naturally break down to safe levels before reaching the river.

2.2.3 Nature and Extent of Contamination.

- Low levels of VOCs are found in the groundwater throughout OU 3, however, contaminants found at unacceptable concentrations are limited to nine relatively small plumes: six in the upper zone (Areas A, E, F, and G; Building 780; PSC 48) and three in the lower zone (Areas B, C, and D).
- Contaminants found at OU 3 are primarily chlorinated solvents (PCE, TCE, DCE, and vinyl chloride) in groundwater, and PAHs and metals in sediment from the St. Johns River.
- Samples of storm sewer water from the southern portion of the OU have TCE levels that exceed Florida Surface Water Standards.
- Based on an evaluation by FDEP it was decided that additional study of the plumes at Areas A and E were required. Therefore, groundwater Areas A and E are excluded from this proposed plan and a separate proposed plan will be forthcoming.

2.3 SUMMARY OF SITE RISKS

A human health risk assessment and an ecological risk assessment were conducted as part of the OU 3 RI/FS to determine if contaminants from the site pose a risk to people or the environment. The goal of the risk assessments was to identify those contaminants that may pose an **unacceptable risk** to human health or the environment. Once these contaminants were identified, cleanup goals and cleanup options were developed. Based on the current and anticipated future use of land at NADEP, the USEPA, Navy, and FDEP agreed that the RI/FS for OU 3 would consider current and future industrial (non-residential) land use exposure scenarios.

The risk assessment process has four steps:

- Evaluation and **statistical analysis** of contaminants identified in each medium during the field program to select **chemicals of concern** for human health and the environment,
- Assessment of ways humans or ecological receptors could come in contact with the chemicals of concern in soil, groundwater, surface water, sediment, and storm sewer water at OU 3, both now and in the future,
- Evaluation of possible harmful effects of being exposed to the chemicals of concern,
- Estimation of overall risk posed to people or the environment from OU 3 contaminants.

Section 2.3.1 presents an overview of the numbers generated by the human health risk assessment. Section 2.3.2 presents an overview of the numbers generated by the ecological risk assessment. Section 2.3.3 presents the major conclusions from both risk assessments. Section 2.3.4 discusses the

risk evaluation results for PSCs 11, 12, 13, 14, and 15.

2.3.1 Human Health Risks

Soil, Surface Water, and Storm Sewer Water. The statistical analysis conducted as part of the human health risk assessment determined that there were no current unacceptable risks to humans from being exposed to contaminants in the soil and surface water at OU 3. The risk assessment also found that contaminants in the storm sewer water do not pose an unacceptable risk to persons, such as utility workers, who might come in contact with the water. However, even though there is no unacceptable risk to humans, the amount of TCE in the storm sewer water exceeds the Florida Surface Water Standards.

Groundwater, Area B. The statistical analysis of contaminants resulted in DCE, PCE, and TCE being selected as chemicals of concern to people who are exposed to the groundwater at Area B. If groundwater were to be used (e.g., for drinking or bathing), people would be exposed to a concentration (referred to as the **exposure point concentration**) of 3 **micrograms per liter ($\mu g/\ell$)** of DCE. This concentration was lower than the Florida Groundwater Guidance Concentration (GGC) of 7 $\mu g/\ell$ and the Federal Maximum Contaminant Level (MCL) of 7 $\mu g/\ell$. PCE and TCE have exposure point concentrations (40 and 9,800 $\mu g/\ell$, respectively) which were higher than the Florida GGC (3 $\mu g/\ell$ for both chemicals) and the Federal MCL (5 $\mu g/\ell$ for both chemicals).

Because NADEP is a highly industrialized area and all employees at NADEP get their drinking water from the City of Jacksonville, the Navy, USEPA, and FDEP agreed that there is no current risk to NADEP personnel. Although it is unlikely, there is a possibility that sometime in the future NADEP personnel may want to drink the groundwater from Area B. The Navy ran a statistical analysis and found that the risk of developing cancer from drinking the contaminated groundwater was 4×10^{-4} (or 4 in 10,000 – values higher than 1×10^{-6} [or one in a million] are considered "unacceptable" by both USEPA and FDEP). The analysis also showed that the risk of developing a non-cancer disease was 16 (values above 1 are considered "unacceptable" by both USEPA and FDEP).

Groundwater, Area C. The statistical analysis resulted in TCE being selected as a chemical of concern to people who are exposed to groundwater at Area C. TCE had an exposure point concentration of 1,700 $\mu g/\ell$ which is higher than the Florida GGC (3 $\mu g/\ell$) and the Federal MCL (5 $\mu g/\ell$).

The scenario at Area C is the same as Area B – there is no risk to NADEP workers today. Because NADEP workers may want to drink the groundwater from Area C sometime in the future, the Navy ran a statistical analysis to determine the risk. The analysis found that the risk of developing cancer was 7×10^{-5} (or 7 in 100,000) and the risk of developing a non-cancer disease was 3. Both measures of risk are considered unacceptable by USEPA and FDEP.

Groundwater, Area D. The statistical analysis resulted in DCE, PCE, TCE, and arsenic being selected as chemicals of concern to people who are exposed to groundwater at Area D. DCE had an exposure point concentration of 4.1 $\mu g/\ell$ which is less than both the Florida GGC (7 $\mu g/\ell$) and the Federal MCL (7 $\mu g/\ell$). PCE had an exposure point concentration of 8.4 $\mu g/\ell$ which is greater than the Florida GGC (3 $\mu g/\ell$) and the Federal MCL (5 $\mu g/\ell$). TCE had an exposure point concentration of 4,100 $\mu g/\ell$ which is greater than the Florida GGC (3 $\mu g/\ell$) and the Federal MCL (5 $\mu g/\ell$). Arsenic had an exposure point concentration of 17 $\mu g/\ell$ which is less than both the Florida GGC (50 $\mu g/\ell$) and the Federal MCL (50 $\mu g/\ell$); however, it is higher than the background level of 13.2 $\mu g/\ell$. (Background concentrations are considered for inorganic compounds because they occur naturally in nature as opposed to chlorinated compounds which do not occur naturally in nature).

The scenario at Area D is the same at Area B – there is no risk to NADEP workers today. Because NADEP workers may want to drink the groundwater from Area D sometime in the future, the Navy ran a statistical analysis to determine the risk. The analysis found that the risk of developing cancer was 3×10^{-4} (or 3 in 10,000) and the risk of developing a non-cancer disease was 7. Both measures of risk are considered unacceptable by USEPA and FDEP.

Groundwater, Area F: The statistical analysis resulted in DCE, TCE, and vinyl chloride being selected as chemicals of concern to people who are exposed to groundwater at Area F. DCE had an exposure point concentration of 38 $\mu g/\ell$ which is higher than the Florida GGC (7 $\mu g/\ell$) and the Federal MCL (7 $\mu g/\ell$). TCE had an exposure point concentration of 4,200 $\mu g/\ell$ which is greater than the Florida GGC (3 $\mu g/\ell$) and the Federal MCL (5 $\mu g/\ell$). Vinyl chloride had an exposure point concentration of 2.8 $\mu g/\ell$ which is greater than the Florida GGC (1 $\mu g/\ell$) and the Federal MCL (2 $\mu g/\ell$).

The scenario at Area F is the same at Area B – there is no risk to NADEP workers today. Because NADEP workers may want to drink the groundwater from Area F sometime in the future, the Navy ran a statistical analysis to determine the risk. The analysis found that the risk of developing cancer was 3×10^{-4} (or 3 in 10,000) and the risk of developing a non-cancer disease was 7. Both measures of risk are considered unacceptable by USEPA and FDEP.

Groundwater, Area G: The statistical analysis resulted in DCE, TCE, and vinyl chloride being selected as chemicals of concern to people who are exposed to groundwater at Area G. DCE had an exposure point concentration of 290 $\mu g/\ell$ which is greater than the Florida GGC (7 $\mu g/\ell$) and the Federal MCL (7 $\mu g/\ell$). TCE had an exposure point concentration of 2,000 $\mu g/\ell$ which is greater than the Florida GGC (3 $\mu g/\ell$) and the Federal MCL (5 $\mu g/\ell$). Vinyl chloride had an exposure point concentration of 30 $\mu g/\ell$ which is greater than the Florida GGC (1 $\mu g/\ell$) and the Federal MCL (2 $\mu g/\ell$).

The scenario at Area G is the same at Area B – there is no risk to NADEP workers today. Because NADEP workers may want to drink the groundwater from Area G sometime in the future, the Navy ran a statistical analysis to determine the risk. The analysis found that the risk of developing cancer was 9×10^{-4} (or 9 in 10,000) and the risk of developing a non-cancer disease was 4. Both measures of risk are considered unacceptable by USEPA and FDEP.

Groundwater, PSC 48. No formal risk analysis was performed for PSC 48 because very high concentrations of chlorinated compounds were found in 1993 during the SSFP and again in 1995 during an engineering evaluation and cost analysis. The levels in 1995 were as follows: PCE – 36,000 $\mu g/\ell$, TCE – 11,000 $\mu g/\ell$, DCE – 4,000 $\mu g/\ell$, and vinyl chloride – 150 $\mu g/\ell$. All of these compounds are much greater than both State of Florida and Federal regulatory limits.

Due to these high concentrations in the groundwater, PSC 48 was considered a definite risk to people now and that risk drove the Navy, FDEP, and USEPA to start cleanup as soon as funding was available.

Groundwater, Building 780. No formal risk analysis was performed for Building 780 because very high concentrations of chlorinated compounds were found when NADEP converted the building into a closed-loop solvent recycling facility in 1990/1991 and again in 1995 during the engineering evaluation and cost analysis. The levels in 1995 were as follows: **trichloroethane (TCA)** – 260 $\mu g/\ell$, DCA – 8,900 $\mu g/\ell$, **chloroethane** – 6,900 $\mu g/\ell$, TCE – 870 $\mu g/\ell$, DCE – 8,800 $\mu g/\ell$, and vinyl chloride – 6,400 $\mu g/\ell$. All of these compounds are much greater than both State of Florida and Federal regulatory limits.

Due to these high concentrations in the groundwater, Building 780 was considered a definite risk to people now and that risk drove the Navy, FDEP, and USEPA to start cleanup as soon as funding was available.

2.3.2 Ecological Risks

Sediment. The statistical analysis for an ecological risk assessment is somewhat different from a human health risk assessment. An ecological risk assessment has to consider all living things, except humans. For instance, an ecological risk assessment looks at birds, animals, reptiles, bugs, worms, fish, plants, trees, coral, and sea grass.

Sampling in the St. Johns River included surface water samples and sediment samples. The statistical analysis conducted as part of the ecological risk assessment determined that there were no unacceptable risks to the environment from being exposed to contaminants in the surface water; however, there were unacceptable risks to water creatures exposed to sediment.

Analytical sampling results of the sediment showed greater than normal levels of PAHs and metals, but lead was the worst of the metals found. Based on this information, the Navy gathered seven more sediment samples and tested them for toxicity to very small water creatures. All sample results came back with acceptable risk except for one sample where, literally, none of the test animals were able to live. Based on these results and other scientific information, the Navy, FDEP, and USEPA believe that PAHs and lead were the major causes of risk in sediment at PSC 16.

2.3.3 Major Conclusions of the Risk Assessments

The major conclusions of the human health and ecological risk assessments are as follows:

- Contaminants in soil and surface water do not pose an unacceptable risk to human health or the environment.

- Although contaminants in storm sewer water do not pose unacceptable risk, one contaminant (TCE) exceeds the Florida Surface Water Standard and, therefore, must be considered further.

- Unacceptable risk may exist in groundwater (due to chlorinated VOCs) at Areas B, C, D, F, and G and a localized area of sediment (due to PAHs and lead) at PSC 16. Both groundwater and sediment must be considered further.

Based on the conclusions of the human health and ecological risk assessments, it is the Navy's, FDEP's, and USEPA's current judgement that the preferred alternatives (cleanup options) identified in this Proposed Plan are necessary to protect human health and the environment from releases of hazardous substances into the groundwater, storm sewer water, and sediment at OU 3.

2.3.4 Risk Evaluations for PSCs 11, 12, 13, 14, and 15

Specific risk evaluations were conducted for PSCs 11, 12, 13, 14, and 15. The conclusions from these evaluations are summarized below.

<u>PSC 11</u>: Since the tanks, piping, contaminated soil, and building structure were removed from the former plating shop area, there is no need for further cleanup. Likewise, even though contamination found in the eastern part of the jet line hangar during the SSFP was elevated above regulatory limits, based on the risk assessment, there was no unacceptable risk and no cleanup is required.

<u>PSC 12</u>: The soil at this PSC does not pose a risk to human health or the environment that requires cleanup.

<u>PSC 13</u>: Since the radium-contaminated soil and dials have been removed from the PSC, there is no longer a risk to human health or the environment.

<u>PSC 14</u>: The concentration of lead in the soil exceeds the acceptable level for residential development but is below the criteria for industrial usage. Since it is not anticipated that OU 3 will be used for residential development, the site conditions at PSC 14 pose no unacceptable risks to human health or the environment. Land use controls will be used to limit future activities at PSC 14.

<u>PSC 15</u>: Radium-contaminated soil at PSC 15 has been removed except beneath a thick concrete pad or deeper than 3 feet. There could be a risk to human health if persons unknowingly came into contact with the remaining contaminated soil. However, since the contaminated soil is beneath a thick concrete pad or deeper than 3 feet, casual human or animal contact with the soil will not occur. Therefore, there is no unacceptable risk due to soil at PSC 15 unless the cover soils or

concrete pad are removed. Land use controls will be used to limit future activities at PSC 15.

3.0 REMEDIAL ACTION OBJECTIVES FOR OPERABLE UNIT 3

Based on the results of field investigations and risk assessments conducted during the OU 3 RI and in conjunction with the evaluation of legal requirements that may be either **applicable or relevant and appropriate requirements (ARARs)** for this site, **remedial action objectives (RAOs)** were established for the OU. RAOs are cleanup objectives designed to protect human health and the environment by complying with State and Federal requirements. A brief synopsis of these objectives is provided on Table 1. The objectives are used to devise a final remedy for media at OU 3.

RAOs were not established for soil or surface water at OU 3 because no risks were predicted for human or ecological receptors exposed to those media. RAOs were developed for stormwater, groundwater, and sediment.

Technologies for cleanup were then identified and compared to one another based on cost, effectiveness, and ease of construction or implementation. Based on this comparison, technologies were chosen for the remedial action alternatives.

4.0 SUMMARY OF ALTERNATIVES

Remedial alternatives (cleanup options) have been developed for storm sewer water, groundwater, and sediment at OU 3. An overview of each alternative is presented below, and the key components of each alternative are described in Table 2. These alternatives were developed by the Navy, USEPA, and FDEP. The Navy, USEPA, and FDEP have agreed upon the preferred cleanup option for each media and area. Briefly, they are: storm sewer water (deferred to Area F), Area B (enhanced biodegradation), Area C (enhanced biodegradation), Area D (enhanced biodegradation), Area F (chemical oxidation), Area G (chemical oxidation), and sediment (removal of tar balls). These cleanup preferences are discussed in Section 5.

4.1 STORM SEWER WATER

The portion of the OU 3 storm sewers that needs to be cleaned up is shown in Figure 4. The following two remedial alternatives were developed for storm sewer water at OU 3:

***No Action*:** This cleanup option includes **administrative actions** such as storm sewer water monitoring and 5-year reviews. This option does not reduce contaminant **toxicity**, mobility, or volume. No action is used as a baseline for comparison against other options for cleanup of storm sewer water.

***Cured-In-Place (CIPP)*:** This alternative consists of lining a portion of the storm sewers to stop contaminated groundwater from leaking into the sewer. CIPP is a liner that is attached to the inside of the leaking sewer pipe. This alternative also includes storm sewer water monitoring and 5-year reviews.

4.2 GROUNDWATER

The key components of each groundwater alternative are presented in Table 2. A summary of the alternatives developed for groundwater at Areas B, C, D, F, and G is presented in Table 3.

The following is a general description of each remedial alternative that was developed for groundwater at OU 3:

***No Action*:** This cleanup option includes administrative actions such as groundwater monitoring, groundwater use restrictions, and 5-year reviews. This option does not reduce contaminant toxicity, mobility, or volume. No action is used as a baseline for comparison against other options for cleaning up groundwater.

Groundwater use restrictions at OU 3 shall be identified and enforced under the guidelines of the MOA between the USEPA, FDEP and U.S. Department of the Navy (signed on August 31, 1998).

***Natural Attenuation*:** This method achieves cleanup by the reduction of VOCs in groundwater at OU 3 through natural biological, chemical, and

Table 1
Remedial Action Objectives for OU 3

Media	Contaminants Causing Unacceptable Risk	Remedial Action Objectives	Key ARARs
Storm Sewer Water	TCE	Manage contaminated storm sewer water to achieve Florida Surface Water Standards within the zone of tidal influence.	Florida Surface Water Standard, Class III Freshwater, and Federal Ambient Water Quality Criteria
Groundwater	Chlorinated VOCs	Address groundwater contamination at Areas A, B, C, D, E, F, and G containing concentrations of chemicals above ARARs.[1]	Federal Maximum Contaminant Levels, Florida Groundwater Guidance Concentrations and USEPA Region III Risk-based concentration, tapwater
Sediment	PAHs and lead	Reduce ecological receptor exposure to sediment containing lethal concentrations of PAHs and lead.	Florida Sediment Quality Assessment Guidelines, USEPA Sediment Quality Criteria, and National Oceanic and Atmospheric Administration Sediment Guidelines

[1] A separate proposed plan will be prepared to address the remedial action objective for groundwater at Areas A and E.

Notes: ARARs = applicable or relevant and appropriate requirements.
OU = operable unit.
VOCs = volatile organic compounds.
TCE = trichloroethene.
PAHs = polycyclic aromatic hydrocarbons.
USEPA = U.S. Environmental Protection Agency.

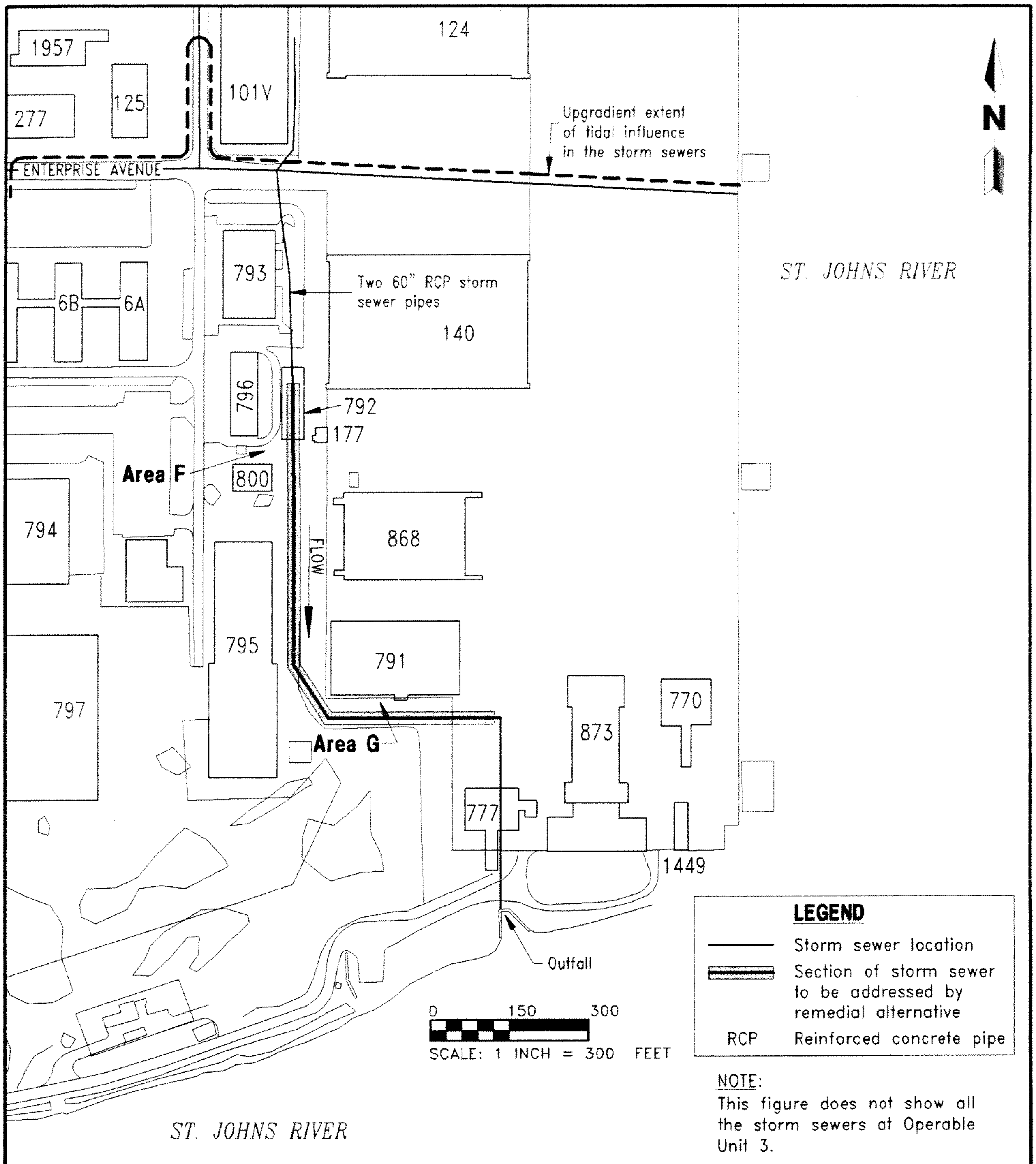

Figure 4: Portion of Storm Sewers to be Addressed by Remedial Alternatives

Table 2
Key Component of Remedial Alternatives Evaluated for OU 3

Storm Sewer Water Alternatives	Description of Key Components	Will the Alternative Meet ARARs?
No Action	· Storm sewer water monitoring. · Five-year reviews.	No
Cured-in-Place Pipe	· Installation of cured-in-place pipe. · Storm sewer water monitoring. · Five-year reviews.	Yes
Groundwater Alternatives	**Description of Key Components**	
No Action	· Groundwater use restrictions, monitoring, and 5-year reviews.	No
Natural Attenuation	· Groundwater monitoring for contaminants and biodegradation parameters. · Modeling of groundwater flow and degradation processes. · Groundwater use restrictions, and 5-year reviews.	Yes
Enhanced Biodegradation	· Installation of a HRC™ injection system. · Groundwater monitoring for contaminants and biodegradation parameters. · Treatability studies. · Groundwater use restrictions, and 5-year reviews.	Yes
Extraction and Treatment	· Groundwater extraction. · Pretreatment of extracted groundwater via packed tower air stripping or UV/OX. · Discharge of pretreated groundwater to the facility's FOTW. · Treatability studies and treatment system monitoring. · Groundwater use restrictions, monitoring, and 5-year reviews.	Yes
Air Sparging	· Air sparging. · Soil vapor extraction with temporary GAC treatment (if necessary). · Treatability studies and treatment system monitoring. · Groundwater use restrictions, monitoring, and 5-year reviews.	Yes
Chemical Oxidation	· Groundwater extraction and oxidant injection. · In situ chemical oxidation. · Treatability studies and treatment system monitoring. · Groundwater use restrictions, monitoring, and 5-year reviews.	Yes
Sediment Alternatives	**Description of Key Components**	
No Action	· None.	No
Dredging	· Sampling to confirm remediation boundaries. · Installation of a containment barrier. · Dredging and disposal of sediment.	Yes
Selective Removal of Tar Balls	· Sampling to confirm remediation boundaries. · Installation of a containment barrier. · Selective removal and disposal of tar balls in sediment.	Yes

Notes: OU = operable unit.
HRC™ = hydrogen release compound.
UV/OX = ultraviolet light and oxidation.
FOTW = federally owned treatment works.
GAC = granular activated carbon.
ARARs = applicable or relevant and appropriate requirements.

Table 3
Remedial Alternatives Evaluated for Groundwater at OU 3

	No Action	Natural Attenuation	Enhanced Biodegradation	Extraction and Treatment	Air Sparging	Chemical Oxidation
Area B	X		X	X		X
Area C	X		X	X		
Area D	X		X	X		
Area F	X	X			X	X
Area G	X	X			X	X

physical processes occurring in the shallow zone of the surficial aquifer. Bacteria which naturally live in the soil destroy contaminants by eating them as food. Physical processes such as **volatilization**, **sorption**, **advection**, and **dispersion** further reduce contaminant concentrations naturally within the aquifer.

The natural attenuation alternative includes groundwater monitoring (for contaminants and biodegradation parameters), groundwater use restrictions, groundwater **modeling**, and 5-year reviews.

***Enhanced Biodegradation*:** This alternative consists of injecting nutrients, such as the **polylactate ester** hydrogen release compound (HRC™), into a groundwater plume to stimulate bacterial growth and enhance (i.e., speed up) natural biodegradation. In addition to injection of nutrients, this alternative includes groundwater monitoring for contaminants and biodegradation parameters, treatability studies to collect information for design of the HRC™ injection system, groundwater use restrictions, and 5-year reviews.

***Extraction and Treatment*:** This alternative includes pumping out the contaminated groundwater, pretreatment of the extracted groundwater, and discharge to the NAS Jacksonville federally owned treatment works (FOTW) for final treatment. Two technologies for pretreatment of the extracted groundwater were evaluated in the feasibility study report for OU 3: **air stripping** and ultraviolet light and oxidation (UV/OX).

Air stripping removes VOCs from the extracted groundwater by bubbling air through the water. UV/OX uses a combination of UV lamps and an **oxidant** such as hydrogen peroxide to destroy organic contaminants in the extracted groundwater. After pretreatment by either air stripping or UV/OX, the extracted groundwater would be discharged to the FOTW for further treatment.

This alternative also includes **treatability studies** to collect information for improved design of the treatment method.

***Air Sparging*:** The air sparging alternative consists of injecting air into groundwater to create turbulence in the groundwater and enhance volatilization of the organic contaminants. In areas where contaminated groundwater is overlain by buildings or pavement, this alternative includes collection of vapors from the overlying soil by an SVE system. This alternative also includes treatability studies to collect information for improved design of the methods.

***Chemical Oxidation*:** *In situ* chemical oxidation involves the injection of an oxidant such as potassium permanganate ($KMnO_4$) into the groundwater to chemically destroy the VOCs. Groundwater would be pumped from the aquifer, dosed with oxidant, and then reinjected at an **upgradient** location. This causes flushing of the contaminated zone until the VOCs are removed. Prior to implementing this alternative, **pilot-scale** studies would be conducted to establish: 1) the feasibility of injecting and adequately distributing the oxidant solution through the zone of contaminated groundwater; 2) an estimate of VOC destruction efficiency; and 3) the optimum concentration of oxidant in the solution. Other components of the chemical oxidation alternative are treatment system monitoring, groundwater use restrictions, groundwater monitoring, and 5-year reviews.

4.3 SEDIMENT

The area of OU 3 sediment to be addressed by the selected remedial action is shown in Figure 5. The following three cleanup alternatives were developed for sediment at OU 3:

***No Action*:** This cleanup option is true no action. No administrative action of any kind is proposed. This option does not reduce contaminant toxicity, mobility, or volume. No action is used as a baseline for comparison against other options for cleaning up sediment.

***Dredging*:** This alternative consists of **dredging** to remove contaminated sediment from the bottom of the St. Johns River, adjacent to the PSC 16 storm water outfall. The proposed dredging area includes the locations at which tar balls were observed during the sediment sampling events. The initial step of this alternative is collection of sediment samples and analysis for PAHs, lead, grain size, and total organic carbon, and

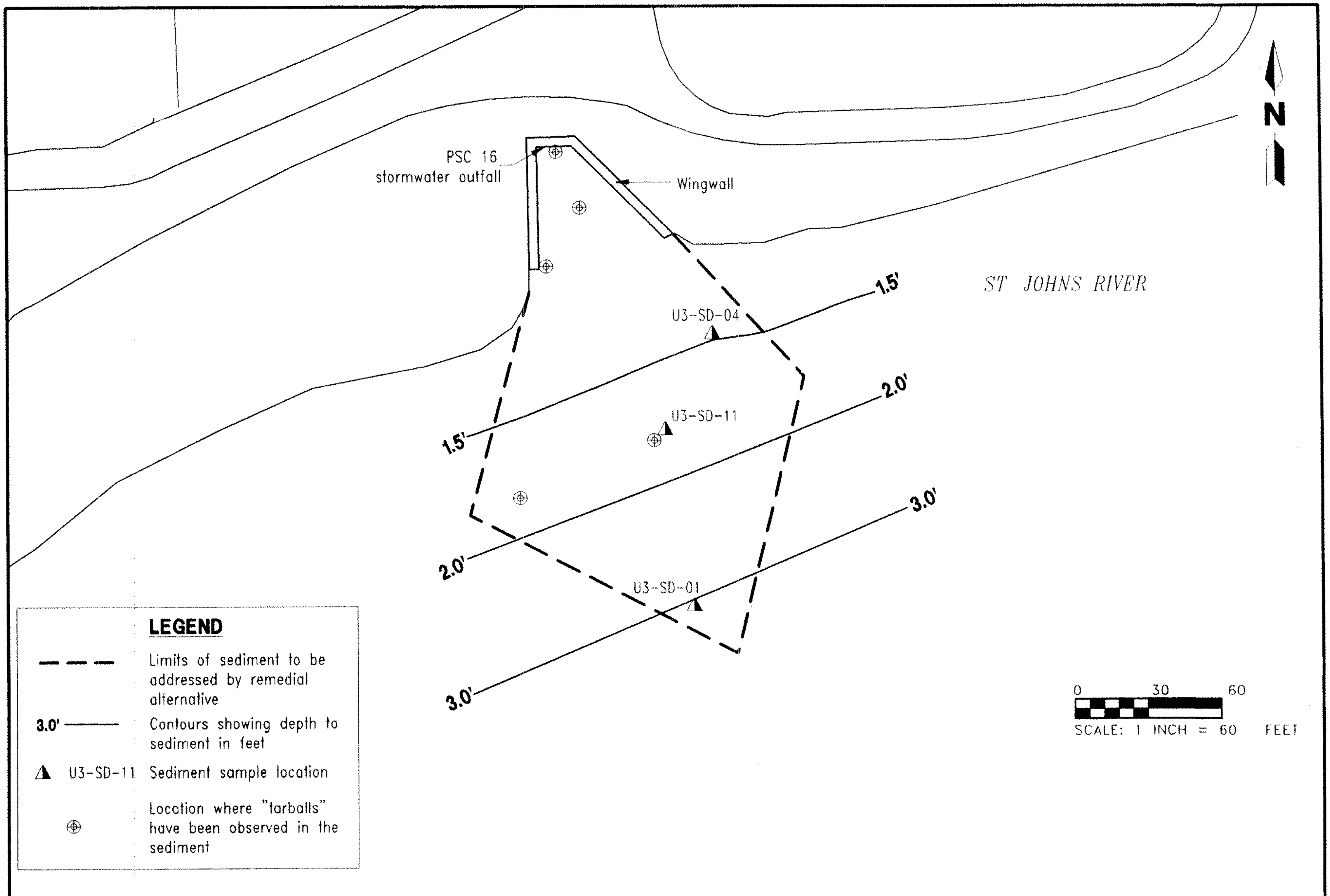

Figure 5: Area of Sediment to be Addressed by Remedial Alternative

toxicity testing, to better establish the limits of remediation. Dredging may potentially resuspend contaminated sediment. Therefore a silt screen **containment** barrier would be installed around the dredging boundary to limit offsite **migration** of any suspended sediment. The dredged sediment slurry would be allowed to settle so that the **decanted** water could be drained back to the St. Johns River, and the sediment could be transported to an offsite disposal facility. Backfilling may be required if sediments are contaminated deeper than expected.

***Selective Removal of Tar Balls*:** This method involves sifting through the sediment with a raking device to remove the embedded tar balls. Similar to dredging, this alternative includes collection of sediment samples and analysis for PAHs, lead, grain size, and total organic carbon and toxicity testing to establish the limits of remediation. The extracted tar balls would be placed in containers and disposed of at an offsite disposal facility.

Like dredging, raking may resuspend contaminated sediment. Therefore, a silt screen containment barrier would be installed around the raking boundary to limit offsite migration of any suspended sediment. Also, backfilling could be required if the tar balls are deeper than what was found in 1999. Once the tar balls are removed, a final round of sediment sampling and analysis, as described above, will be conducted to show that the remaining sediment is no longer lethal to water creatures.

The estimated cost and cleanup time for each remedial alternative evaluated for storm sewer water, groundwater, and sediment at OU 3 is presented in Table 4.

5.0 EVALUATION OF THE CLEANUP METHODS AND THE PREFERRED CHOICE

In selecting the preferred cleanup methods, nine criteria were used (see Table 5). The first seven are technical criteria based on protectiveness, cost, and engineering feasibility issues. The preferred cleanup method was further evaluated based on the final two criteria: acceptance by the USEPA and FDEP, and acceptance by the community.

Using the threshold and primary balancing criteria in Table 5, the remedial alternatives for OU 3 were evaluated individually and against one another in order to select a preferred remedy. For groundwater, the focus of this evaluation was placed on comparison of alternatives for a particular hot spot area. For example: the three alternatives evaluated for Area B groundwater (enhanced biodegradation, extraction and treatment, and chemical oxidation) were evaluated against the seven criteria separately, then in a comparative analysis, noting how each compared to the other options being considered.

The preferred alternatives for cleanup of contaminated media at OU 3 are those that most closely satisfy the threshold and primary balancing criteria when compared to the other alternative under consideration.

The FDEP and USEPA have concurred with the Navy's selection of the preferred alternatives for storm sewer water, groundwater, and sediment at OU 3.

Community acceptance of the preferred alternatives will be evaluated after the public comment period ends, and will be addressed in the Responsiveness Summary prepared for the ROD.

Based on the results of this analysis, which is detailed in the RI/FS for OU 3, the following were selected as the preferred alternatives for cleanup of OU 3.

Summary of the Preferred Alternatives

In summary, the following cleanup methods for storm sewer water, groundwater (Areas B, C, D, F, and G), and sediment were selected as the preferred alternatives by the USEPA, FDEP, and the Navy. These offer the best balance among three components of remedial action: risk reduction, cleanup time, and cost. It is important to note that all of the preferred alternatives are considered protective of human health and the environment, they comply with Federal and State of Florida regulations (ARARs), they utilize permanent solutions to the maximum extent practicable, and they satisfy the statutory preference for treatment as a principal element.

Table 4
Estimated Costs and Cleanup Times for Remedial Alternatives Evaluated for OU 3

	Estimated Cost[1]	Estimated Cleanup Time
Storm Sewer Water		
No Action	$84,800	30 years[2]
Cured-In-Place Pipe	$2,127,300	5 years[5]
Groundwater		
Area B:		
No Action	$264,300	30 years[2]
Enhanced Biodegradation	$539,700	4 years
Extraction and Treatment	$786,800[3]/$1,157,100[4]	5 years
Chemical Oxidation	$554,300	8 months
Area C:		
No Action	$264,300	30 years[2]
Enhanced Biodegradation	$819,300	4 years
Extraction and Treatment	$1,789,600[3]/$2,135,200[4]	18 years
Area D:		
No Action	$264,300	30 years[2]
Enhanced Biodegradation	$956,600	4 years
Extraction and Treatment	$1,675,400[3]/$2,024,200[4]	17 years
Area F:		
No Action	$264,300	30 years[2]
Natural Attenuation	$615,900	38 years
Air Sparging	$1,027,000	6 years
Chemical Oxidation	$1,178,300	5 years
Area G:		
No Action	$264,300	30 years[2]
Natural Attenuation	$619,900	39 years
Air Sparging	$746,100	6 years
Chemical Oxidation	$1,162,600	5 years
Sediment		
No Action	0	NA
Dredging	$308,900	2 months
Selective Removal of Tar Balls	$79,900	1 month

[1] Cost estimates may vary depending on assumptions made for interest and inflation rates.
[2] An implementation time of 30 years was used, based on U.S. Environmental Protection Agency guidance.
[3] Treatment of extracted groundwater by air stripping.
[4] Treatment of extracted groundwater by ultraviolet light and oxidation.
[5] Cleanup time is complete after installation; however, monitoring will continue for 5 years.

Note: NA = not applicable.
OU = operable unit.

Table 5
Explanation of Evaluation Criteria

Criteria	Description
Threshold	**Overall Protection of Human Health and the Environment.** This criterion evaluates the degree to which each alternative eliminates, reduces, or controls potential risks to human health and the environment through treatment, engineering methods, or institutional controls (e.g., access restrictions). **Compliance with State and Federal Regulations.** Alternatives are evaluated for compliance with environmental protection regulations determined to be applicable or relevant and appropriate to site conditions.
Primary Balancing	**Long-Term Effectiveness.** Alternatives are evaluated on their ability to maintain reliable protection of human health and the environment after implementation. **Reduction of Contaminant Toxicity, Mobility, and Volume Through Treatment.** Alternatives are evaluated on how they reduce the harmful nature of the contaminants, ability of contaminants to move through the environment, and the amount of contamination. **Short-Term Effectiveness.** The length of time needed to implement each alternative is considered. The risks that implementation of a particular alternative may pose to workers and nearby residents (e.g., whether contaminated dust would be produced during excavation) is assessed. **Implementability.** The technical feasibility and administrative ease (i.e., the amount of coordination with other government agencies that is needed) of each alternative, including availability of necessary goods and services, is assessed. **Cost.** The benefits of implementing a particular alternative are weighed against the cost of implementation.
Modifying	**U.S. Environmental Protection Agency (USEPA) and Florida Department of Environmental Protection (FDEP) Acceptance.** The Navy requests USEPA and FDEP comments on the RI/FS Report and the Proposed Plan as part of the FFA. The final RI/FS Report and the Proposed Plan, which are placed in the Information Repository, represent a consensus by the Navy, USEPA, and FDEP. **Community Acceptance.** The Navy assesses community acceptance of the preferred alternative by giving the public an opportunity to comment on the remedy selection process.

Notes: RI/FS = Remedial Investigation and Feasibility Study.
FFA = Federal Facility Agreement.

Storm Sewer Water. The likely source of TCE at concentrations above the Florida Surface Water Standards in the storm sewer water is infiltrating groundwater. The elevated concentrations of TCE have been detected in a portion of the storm sewers near groundwater hot spot Area F. Therefore, once the Area F groundwater has been treated by its selected remedial alternative, it is expected that TCE may no longer exceed the State criteria in the storm sewer water. The following course of action has been selected as the preferred cleanup method for the storm sewer water at OU 3.

- Collect samples of water in the storm sewers and analyze for VOCs after completion of the remedial activities at groundwater Area F. If the concentrations of VOCs are below the Florida Surface Water Standards, no further action is required for the storm sewer water. If the concentrations of the VOCs exceed Florida Surface Water Standards, installation of CIPP will be strongly considered for the selected remedial alternative for the storm sewer water.

Groundwater:

Area B. The preferred cleanup method for groundwater at Area B is enhanced biodegradation.

Area C. The preferred cleanup method for groundwater at Area C is enhanced biodegradation.

Area D. The preferred cleanup method for groundwater at Area D is enhanced biodegradation.

Area F. The preferred cleanup method for groundwater at Area F is chemical oxidation.

Area G. The preferred cleanup method for groundwater at Area G is chemical oxidation.

Sediment. The preferred cleanup method for sediment adjacent to the PSC 16 storm water outfall at OU 3 is selective removal of tar balls.

The feasibility study for OU 3 assumed that a manually controlled raking device (similar to a garden rake) will be used to screen tar balls from the surrounding sediment. An alternate type of device may be specified during the design phase if it accomplishes effective removal of the tar balls.

Other PSC Areas. As discussed in Section 2, there are several other PSCs and areas which are part of OU 3. These areas have had site specific supplemental investigations, risk evaluations, and/or ongoing cleanup activities. The results of these efforts were evaluated in the RI and the preferred remedial actions for these sites are as follows:

PSC 48 and Building 780. As discussed in Section 2.1 of this proposed plan, IRAs are currently being conducted at PSC 48 (Building 106) and Building 780. The objectives of the IRAs at PSC 48 and Building 780 are to reduce present or future risks posed to human health and the environment, and to reduce contaminant concentrations in hot spots or source areas.

The IRA at PSC 48 consists of an air sparge and SVE system. The IRA at Building 780 includes groundwater extraction and treatment by air stripping, and SVE. The remedial systems at both sites are removing significant quantities of contaminants. Therefore, the following action is the preferred remedial action for both PSC 48 and Building 780:

- Continue the ongoing operation of cleanup systems at PSC 48 and Building 780.

PSC 11. No further remedial action planned (NFRAP) based on no unacceptable risk to human or ecological receptors.

PSC 12. NFRAP based on no unacceptable risk to human or ecological receptors.

PSC 13. NFRAP based on a previous removal action and clearance of the site for unrestricted use by the U.S. Navy Radiological Affairs Support Office.

PSC 14. NFRAP based on no unacceptable risk to human or ecological receptors; however, land use controls will be maintained and enforced.

PSC 15. NFRAP with land use controls based on no unacceptable risk to human or ecological receptors; however, land use controls will be maintained and enforced.

6.0 COMMUNITY PARTICIPATION ACTIVITIES

Community acceptance of this Proposed Plan is the next step in the overall cleanup for OU 3.

Public Comment Period. A public comment period will be held from April 17, 2000 through May 31, 2000. During this time, NAS Jacksonville residents or personnel, the surrounding community, and other interested parties are encouraged to submit comments on the RI/FS Report and the Proposed Plan. Interested parties may submit written comments to the NAS Jacksonville Public Affairs Office at the address listed below. Comments must be postmarked no later than Wednesday, May 31, 2000. Based on public comments or new information, the Navy may modify the preferred cleanup methods or choose another method developed during the RI/FS.

Send Public Comments To:

Mr. Bill Dougherty
Public Affairs Office, Box 2
Naval Air Station Jacksonville
Jacksonville, Florida 32212-5000
Fax: (904) 542-2413
Email: doughertyb@cnrse.navy.mil

Preparation of the ROD. Following the public comment period, the USEPA, FDEP, and the Navy will prepare and sign a ROD for OU 3, NAS Jacksonville. The ROD will describe the cleanup methods selected for the various areas and will include a Responsiveness Summary, containing the Navy's responses to comments from the public. After this, cleanup actions will begin at OU 3.

Ongoing Informational Updates. NAS Jacksonville is committed to keeping the local community involved in environmental restoration at OU 3 and elsewhere at the station. A Restoration Advisory Board (RAB), composed of community and government agency representatives, meets regularly to discuss the environmental program. At these meetings, community RAB members provide input and offer suggestions on environmental activities. Upcoming RAB meetings are publicized in the local media and are open to the public. NAS Jacksonville also sponsors regular Town Meetings on the **Installation Restoration Program** status and maintains a community mailing list. If you would like to be added to the mailing list, please contact Mr. Bill Dougherty at the address or phone number below.

Available Information. Copies of the documents prepared by the Navy during its investigation and study of OU 3, including the RI/FS Report and this Proposed Plan, are available for review at the **information repository**, located at:

Charles D. Webb Wesconnett Branch
Jacksonville Public Library
6887 103rd Street
Jacksonville, FL 32210
(904) 778-7305

For further information on OU 3 or any other Installation Restoration Program activities at NAS Jacksonville, please contact:

Mr. Bill Dougherty
Public Affairs Office, Box 2
Naval Air Station Jacksonville
Jacksonville, FL 32212
Phone: (904) 542-4032, Fax: (904) 542-2413
Email: doughertyb@cnrse.navy.mil

GLOSSARY

Administrative actions: Activities conducted at sites undergoing cleanup that monitor and review the cleanup progress and may restrict access or use of a site.

Administrative record: A required file of documents that contains the information used to make site management decision, including the Proposed Plan and the ROD. The record is a file maintained specifically for public review.

Advection: Contaminants that move with groundwater.

Air sparging: Injection of air into the groundwater through wells to create turbulence, causing volatile organic compounds to be released as a vapor and carried to the vadose zone by the injected air as it rises.

Air stripping: The removal of VOCs from water by bubbling air through the water.

Applicable or relevant and appropriate requirements (ARARs): The Federal and State requirements that a selected alternative must meet. These requirements vary among sites, contaminants of concern, and remedial alternatives considered.

Aquatic habitat characterization: An evaluation of environmental surrounding aquatic receptors that may be exposed to potential contaminants at a given site. Such a characterization may include surface water quality measures, and observations of sediment, vegetation, and other living matter.

Background levels: Concentrations of chemicals that are present in the environment throughout the area, not just in the study area.

Biodegradation: The breaking down or decomposition of contaminants by bacteria.

Chemicals of concern: Chemicals identified by the risk assessment that may be harmful to human or ecological receptors.

Chlorinated: Organic chemicals which contain the chlorine atom. These chemicals linger in the environment and tend to accumulate in the food chain.

Chloroethane: A chlorinated compound resulting from the natural breakdown of trichloroethane (TCA).

Comment period: A specified period of time, usually 30 to 45 days for remedial actions, during which the public is encouraged to comment on a particular decision or document in the cleanup process, such as the Proposed Plan and the RI/FS report.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): A law passed in December 1980 that was designed to resolve issues associated with abandoned, uncontrolled, inactive hazardous waste disposal sites.

Containment: A way to restrict the mobility of contaminants.

Contamination: Waste materials, chemicals, toxic substances, or wastewater that enter water, soil, or air in amounts that make the water, soil, or air unfit for its intended use.

Decanted: Drawing off the water without disturbing the sediment which has settled.

Dichloroethene (DCE): A man-made chlorinated solvent that is used to make flexible films for packaging. DCE is also made as trichloroethene (TCE) biodegrades. Available information suggests that DCE causes central nervous system depression and liver toxicity in people. USEPA classifies DCE as a possible human carcinogen.

Discharge: The release of water from one system or process to another (e.g., water from a treatment process flowing into a stream, or groundwater flowing naturally into a lake or river).

Dispersion: The mixing and dilution of contaminants within flowing water.

Dredging: Removal of mud or sediments from the bottom of a surface water body (i.e., a river, pond, or lake).

Ecological receptor: A plant or animal that could be exposed to contaminants at a site, such as a fish swimming in contaminated water, a plant growing in contaminated soil, or an animal or bird drinking contaminated water.

Elevated groundwater contamination: For OU 3 this refers to concentrations of contaminants that have chlorinated volatile organic compounds in excess of 1,000 parts of contaminant per one billion parts of water. Also referred to as a "hot spot."

Exposure point concentration (EPC): People are exposed to contaminants by coming into contact with the contaminant. The exposure point is the location where a person comes into contact with the contaminant (e.g., soil where you live or work, the tap bringing water out of the well, etc.). The exposure point concentration is, generally, the average detected concentration of all the samples taken and analyzed for a defined exposure point.

Federal Facility Agreement (FFA): An agreement among government agencies for joint decision making. FFAs are frequently used at federal facility USEPA National Priority List (NPL) sites, such as NAS Jacksonville.

Groundwater: Water found beneath the land surface in soil and rock.

Groundwater extraction and treatment: The removal of groundwater using a pump and then chemically or physically treating the water before discharge.

Human receptor: A person that could be exposed to contaminants at a site, such as a person using contaminated groundwater as drinking water.

Infiltration: Seepage of rainwater or other surface water through the ground and into the soil.

Information repository: A public file containing the administrative record, site information, documents of onsite activities, and general information about a site.

Initial Assessment Study: Potential contaminated areas are identified by reviewing past activities and interviewing workers (both former and current workers) at the site. A few samples of soil and/or water are collected from the potential contaminated areas and tested to see if contaminants are present.

Inorganics: Metal contaminants and other contaminants that do not contain carbon.

Installation Restoration Program: The Department of Defense program created to identify, investigate, evaluate, and, if necessary, cleanup contaminated sites to protect human health and the environment.

Interim Removal Action (IRA): Steps to manage or remove a source of contamination at a site at which a full investigation and cleanup recommendations are not yet complete.

Media or Medium: Naturally occurring physical matter such as soil, groundwater, surface water, sediment, or storm sewer water.

Microgram per liter ($\mu g/\ell$): A scientific unit of measurement. One microgram per liter is also commonly referred to as one part per billion (ppb).

Migration: The movement from one place to another.

Modeling: An investigative technique that prepares a physical or mathematical description to help visualize something that cannot be directly observed.

Monitoring well: Special wells drilled at specific locations within or surrounding a waste site where groundwater can be sampled at selected depths and studied to obtain information about the site. Typical information collected includes the direction in which groundwater flows and the types and amounts of contaminants present.

Natural attenuation: Refers to naturally-occurring processes in soil and groundwater that act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contamination in those media.

Operable Unit (OU): Grouping of sites or media based on types of wastes disposed of, physical proximity, similar past uses, or the suspected contaminants of concern. OU 3 is the third operable unit at NAS Jacksonville.

Organics: Contaminants containing carbon. Organic compounds can usually be broken down by bacteria.

Oxidant: A chemical placed into contaminated water to cause the contaminant to combine with oxygen and thereby become uncontaminated.

Piezometer: A type of well that is installed to measure groundwater elevation and determine the direction of groundwater flow.

Pilot-scale: A small scale test of a treatment technology to measure parameters that will allow the full-scale design.

Plating: The process of coating metal parts with chromium or other metals.

Plume: A zone of contaminants in groundwater that may move with groundwater flow.

Polycyclic aromatic hydrocarbons (PAHs): PAHs, such as benzo(a)pyrene, anthracene, and naphthalene, are components of petroleum that are also formed during incomplete burning of coal, oil gas, or other organic compounds. They are a widespread product of combustion from common sources such as motor vehicles, airplanes, cigarette smoke, and charcoal-broiled foods.

Polylactate ester: A chemical compound that acts as a food source to naturally occurring microorganisms to aid in the breakdown of contaminants.

Potential source of contamination (PSC): Contaminants or a contaminated area that, under existing conditions, could be a source of contamination to the environment.

Radiological survey: A field activity completed to assess whether radiation above normal background levels is present in an area.

Radionuclides: A group of atoms that exhibit radioactivity.

Radium: A radioactive material that was previously used in paint to make airplane cockpit dials glow in the dark.

Reactive chemical: Chemicals that have the ability to undergo a chemical reaction with the release of energy.

Record of Decision (ROD): A document that outlines the remedial action(s) to be implemented at a site. It includes a Responsiveness Summary, the Navy's responses to public comments on the Proposed Plan and the RI/FS report.

Remedial action (RA): Steps taken to manage a source or sources of contamination and migration of contamination at a site. Remedial action begins after a ROD is approved by federal and state authorities.

Remedial action objective (RAO): The final cleanup objectives that must be met by the selected alternative for a site.

Remedial alternative: A combination of technical and administrative actions, developed and evaluated in a feasibility study, that can be used to address contamination at a site.

Remedial Investigation and Feasibility Study (RI/FS): The RI is the first part of the two-part RI/FS. An RI involves collecting and analyzing information about a site to evaluate the nature, magnitude, and extent of contamination in environmental media. The investigation also assesses how conditions at the site may affect human health and the environment in the present or future. The FS is the second part of the two-part RI/FS and is a description and engineering study of the potential cleanup alternatives for a site.

Responsiveness Summary: A section within the ROD for a site that presents the Navy's responses to public comments on the Proposed Plan and RI/FS.

Restoration Advisory Board (RAB): A formal group of agencies, contractors, and citizens that attend public meetings to discuss hazardous waste site cleanup issues.

Risk: A measure of the probability that damage to life, health, property, and/or the environment will occur as a result of a given hazard or event.

Risk assessment: A statistical analysis performed to define risks posed to human health and ecological receptors by the presence of contaminants at a site.

Risk evaluation: An evaluation performed to define risks posed to human health and the environment by the presence of contaminants from a single source or in a single medium at a site. It may be done to determine the need for an interim cleanup action. A risk evaluation is more qualitative than a risk assessment.

Sediment: Solid material that has settled from being suspended in water, such as along a riverbed.

Seepage pit: A relatively deep hole in the ground for the disposal of liquids, which would then slowly seep away.

Sludge: Semi-solid material containing large amounts of liquid that have settled out during use or during treatment of wastewater.

Soil vapor extraction (SVE): The collection and removal of volatilized organics from the vadose zone.

Solvents: Organic liquids used in many industrial processes, such as paint removal, degreasing, and cleaning.

Sorption: The "sticking" of contaminants to soil surfaces due to chemical reactions.

Statistical analysis: A mathematical evaluation using statistics to evaluate the probability (or chance) that something (in this case cancer) will occur.

Storm sewer water: Water that is located within the storm sewer. It can be from surface runoff or from infiltrating groundwater.

Storm water: Surface water from rain or from melting ice or snow. It runs across the ground and is often directed into storm sewers.

Surface water: Water present aboveground such as a pond, river, or drainage ditch.

Surficial aquifer: A geologic formation near the ground surface which is permeable and saturated with water and capable of yielding water in useable quantities.

Tar balls: Congealed, petroleum-saturated clumps mixed with fine-grained sand having a strong petroleum-like odor.

Technologies: Methods or techniques that can be used to reduce or eliminate the concentration of contaminants in a given media (i.e., enhanced bioremediation).

Tetrachloroethene (PCE): A man-made volatile organic compound that is the primary solvent used in the dry cleaning process. PCE is also used extensively in the textile, electronics, and metal industries. PCE targets the liver, kidneys, and nervous system. USEPA classifies PCE as a probable human carcinogen.

Toxic: The property of being poisonous, of causing death or severe temporary or permanent injury to an organism if inhaled, swallowed, or absorbed through the skin.

Toxicity: A relative measure of a substance's ability to damage living tissue or impair normal biological functions, including growth and reproduction.

Treatability study: Laboratory tests conducted to determine how well a certain technology will work on a given contaminant.

Trichloroethane (TCA): A man-made solvent primarily used in the manufacture of dichloroethene (DCE). USEPA classifies TCA as a possible human carcinogen.

Trichloroethene (TCE): A man-made volatile organic compound that is used extensively in industry as a metal degreasing agent. TCE is also used in dry cleaning and as a solvent in paints and adhesives. It may also be formed by the natural biodegradation of tetrachloroethene (PCE). USEPA classifies TCE as a probable human carcinogen.

Unacceptable risk: Risks posed to human health or ecological receptors above a threshold defined by USEPA and FDEP.

Upgradient: The direction of increasing hydraulic energy, or directly opposite of the direction of groundwater flow.

Verification Study: Additional sampling and testing of soil, water, sediment, or other materials at contaminated sites is done to find out what chemicals are present and in what amounts. The Verification Study follows the Initial Assessment Study and attempts to verify the conclusions of the Assessment Study and justify the site progressing to further action (such as an RI/FS or an IRA), if necessary.

Vinyl chloride: A volatile organic compound formed when trichloroethene (TCE) and dichloroethene (DCE) naturally biodegrade. Most of the vinyl chloride produced in the United States is used in the manufacture of polyvinyl chloride and other vinyl polymers. It is a gas and is highly flammable. It is suspected that this compound may cause cancer in humans over long periods of exposure.

Volatile organic compounds (VOCs): Compounds containing carbon and hydrogen that evaporate easily.

Volatilization: The evaporation of contaminants from a liquid into air.